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CONTACT DUPLICATING & RESEAU PRINTER

AND

HIGH RESOLUTION STEP & REPEAT PRINTER

FOURTH MONTHLY LETTER REPORT

November 10, 1964

Period: October 1, 1964 to November 1, 1964

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1.0 CONTACT DUPLICATING AND RESEAU PRINTER

1.1 Purpose

The overall objective of the current contract is the design, fabrication, test, and delivery in fifteen months of a photographic Step and Repeat Contact Duplicating & Reseau Printer. Prime design goals are high speed automatic operation, variable format capability, and high resolution with minimum film distortion or damage. The deliverable equipment will be suitable for operational use. The Printer will accommodate films of 70 mm to 9-1/2" width with frame lengths up to 30 inches, and will offer operation in the Reseau mode as an option.

1.2 Activity of this Report Period

The Design Analysis Report has been submitted to the Contracting Officer, and preparation of the Design Plan Report is well underway. The Design Plan will describe the recommended solutions to the various problem areas with lay-out drawings sufficient in detail to permit evaluation from the standpoint of feasibility, methods, and materials of construction. A technical review meeting was held with the program monitors on October 8th and 9th, at which time the various problem approaches enumerated in the Design Analysis were discussed. A multiple-array exposure source with individual photoelectric control was described which appears to meet the monitors' requirements, for

gross-area control of exposure in accordance with the density variations in the negative frame. Industrial Design renderings of the proposed Printer were submitted.

A demonstration of the breadboard unit, which was held on October 20th, effectively displayed the variable-speed DC motor and magnetic-particle clutch system for film drive and transport. An inflatable pressure-pad device was used for contact printing pressure, and the overall system was run on a 5-1/2 second repetitive time cycle. Automatic photoelectric metering of duplicating film was demonstrated on the breadboard unit, while photoelectric framer sensing of the negative film was shown on a separate mock-up. Reseau grid samples were printed through an aerial negative onto 8430 film and are being evaluated. Resolution target samples exceeding 300 lpm were also displayed to illustrate capability of the proposed light source and contact pressure means.

1.3 Plans for Next Report Period

The forthcoming report period will be devoted to preparation of detailed descriptions and lay-out drawings for the Design Plan. Concurrent effort will be devoted to breadboard testing of exposure sources, photoelectric control circuitry, and refinement of the film drive system to regulate and minimize film tension. Design details of the Pre-View and Punch Station are being resolved to establish optimum means for viewing and punching negative film for accurate and repeatable Reseau

printing.

Film tension measurement tests have been implemented on the breadboard unit to help establish optimum velocity profiles. Reseau grid manufacture is being investigated with two promising sources, and the choice of vacuum-coated lines vs. engraved-and-filled lines is being evaluated.

Exposure tests utilizing several types of lamps and collimating devices are planned to determine the degree of collimation required to optimize resolution, Reseau grid printing, and photoelectric control without producing patterning on the duplicating film. A possible meeting with technical experts on film sensitometry has been proposed by the program monitors for November.

1.4 Problems

No major problems have occurred during the past Report Period to cause program delays, and none are anticipated during the coming month. While design of the film drives, transports, sensors, and contact pressure means are fairly well resolved, the critical problem area outstanding is to breadboard and evaluate several proposed exposure sources and means for automatic exposure control.

1.5 Documentation

The following list summarizes verbal agreements made with the technical monitors during meetings of October 8th, 9th, and 20th.

1. Clarification of Paragraph 3.4.3 of the Purchase Description. Five micron tolerance was amended to read ± 5 microns.

2. Reseau line printing at 12-15 microns was clarified to be at 1.0 density. Paragraph 3.4.2.

3. Technical content of the forthcoming Design Plan was discussed and resolved.

4. A comprehensive list of all previous verbal commitments was submitted to the monitors for approval.

2.0 HIGH RESOLUTION STEP AND REPEAT PRINTER

2.1 Purpose

The purpose of this effort is to design, fabricate, test and deliver in twenty months a high-precision Step and Repeat Photographic Contact Printer. This Printer will be capable of producing photographic contact prints of the highest possible quality, resolution and acutance from roll films of width varying from 70 mm to 9-1/2" and in pre-selected frame lengths from 2-1/4" up to a maximum of 30".

The program will include a six-month Feasibility Study and Design Analysis, followed by a Breadboard Phase. Following design approval, a prototype Printer will be produced in accordance with the Design Plan.

2.2 Activity of this Report Period

2.2.1 RFI and Power Distribution

A system diagram has been prepared which defines nine separate subsystems that will be required for machine function. Interconnection and operation of the subsystems have been defined and continued analysis of all operational requirements is in progress, so that electronic control synthesis can be finalized.

2.2.2 Control Panel

Electronic controls/human factors studies are continuing toward [illegible] configuration. Component selection compatibility with RFI requirements is under analysis. Some concept changes as a result of last month's design review are being considered.

2.2.3 Film Gate

Additional gate studies and experiments were performed, extending to open gate techniques involving vacuum hold down, as well as to a variety of plastic gates. Additional experimental tests of resolution effects are being performed. Preliminary results indicate a marked decrease of Newton fringes can be expected with a plastic gate, with no loss in resolution or film-to-film contact. Problems of rapid and automatic film-to-film contact control have prompted investigations using plastic materials at the exposure gate, which may be easier to implement than exposure through a glass platen. Anti-Newton fringe coatings have been tried with some success, and a low reflection-coated glass sample has been ordered for additional tests.

2.2.4 Exposure Control

Techniques for film scanning are under study for determination of negative maximum and minimum densities on a statistical sampling basis. Statistical studies have indicated that if 60 scans over a complete frame of a negative are made, 92% of all possible density values will be observed with a probability of .95. Further studies for determination of optimum spot size are in progress. Two proposals were solicited from vendors for automatic density scanning devices.

STAT [redacted] was made for evaluation of photochromic materials in photographic dodging. Additional data are being compiled and analyzed for this and other dodging techniques.

2.2.5 Film Handling

The differential equations of motion for the two transport mechanisms being studied have been derived. They are presently being prepared for analysis by analog computer.

Scale drawings showing the basic elements of both systems have been completed and component selection is being studied. A device for measuring film tension has been designed and fabricated. Tests indicate that the desired measurements will be adequately made using the device and a strip oscillograph recorder.

2.2.6 Illumination Source

Manufacturers' data on a variety of light sources is being compiled and analyzed. Laboratory experiments with two-watt argon lamps have indicated it may be possible to use them as a light source. Additional tests involving spectral analysis, life, degradation, and photographic efficiency are being planned for the next period.

2.2.7 Film Frame Identification

The study and evaluation of frame identification methods, and frame identification reading techniques have been completed. The format chosen is a two channel, 18 bit, return to zero (RZ), Binary Coded Decimal Excess Three (BCDX3) arrangement. Preliminary design of the film code reader has commenced with a survey of light sensitive devices. Upon selection of a device, readout and amplifying circuit configurations will be selected and reader optical system requirements defined.

2.3 Plans for Next Reporting Period

2.3.1 Conclude the feasibility study research.

2.3.2 Prepare outline of the Feasibility Report.

2.3.3 Initiate the preparation of the final Feasibility Report.

2.4 Problems

Project personnel clearances are still pending. Document procurement by technical monitor is becoming critical for completion of the Feasibility Study.

2.5 Documentation

There was no additional documentation during this reporting period.

2.5.1 Questions Outstanding

1. List of spool sizes and formats to be furnished by the technical monitor.
2. Document procurement to be furnished by the technical monitor.

AD-438 418 Density Discrimination for Printer Utilization Study

AD-439 600L Test and Evaluate the Kalvar 70MM and 5 inch Roll to Roll Contact Printer/ Processor (EN-85)

AD-430 315 Test and Evaluation of [redacted] STAT

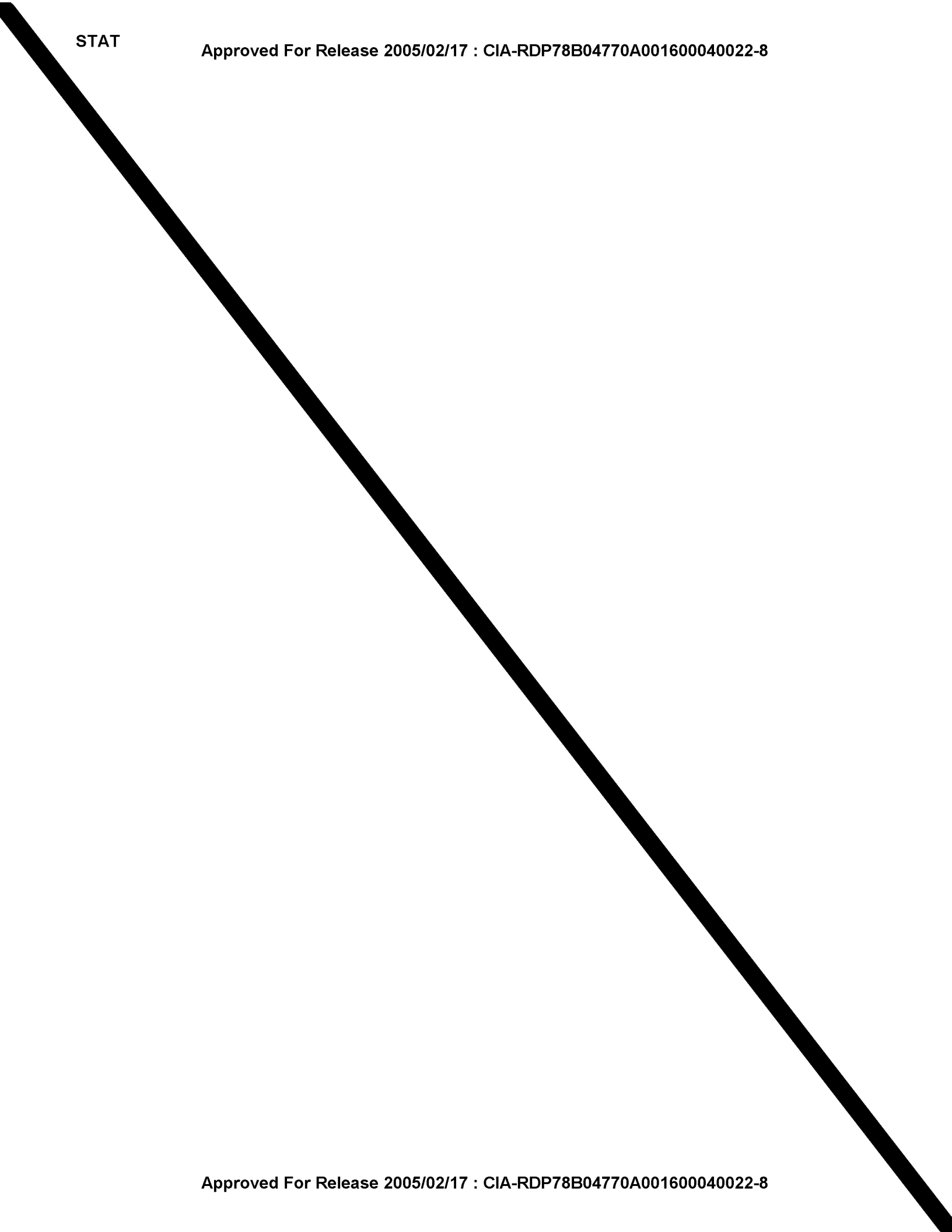
STAT [redacted] 70MM film Processor-January 7,1964.

2.5.1 Questions Outstanding (cont'd)

AD-426 996 A continuous Tone Diazo Reproduction System - September 3, 1963.

AD-405 915 Printer Contact Photographic EN 39 - December 1962

AD-293 047 Test and Evaluation of USAF 70MM Roll Film Printer EN 31 August 1962



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